Performed For:

Michigan Sugar Company
2600 S. Euclid
Bay City, MI 48706
Contact: Meaghan Martuch
Phone: (989) 686-1549
e-mail: Meaghan.martuch@michigansugar.com

Performed by:

Network Environmental, Inc.
2629 Remico, Suite B
Grand Rapids, MI 49519
Contact: Stephan K. Byrd
Phone: (616) 530-6330
Fax: (616) 530-0001
e-mail: netenviro@aol.com

TABLE OF CONTENTS

		Page
I.	Introduction	1
II.	Presentation of Results	2
	II.1 Table 1 – Boiler #4 NO_x RATA Results	2
III.	Discussion of Results	3
	III.1 Boiler #4 NO_x RATA	3
IV.	Source Description	3
V.	Continuous Monitoring System Description	3-4
VI.	Sampling and Analytical Protocol	4-5
	VI.1 Oxides of Nitrogen	4
	VI.2 Oxygen	4-5
	Figure 1 – NO_x & O_2 Sampling Train Diagram	6

Appendices

Reference Method Data Acquisition System Data	A
CEMS Data	B
Calibration Gas & Analyzer Specification Data	C
Calculations	D
Raw Data	E

I. INTRODUCTION

Network Environmental, Inc. was retained by the Michigan Sugar Company to perform a Relative Accuracy Test Audit (RATA) on the Continuous Emissions Monitoring Systems (CEMS) that service Boiler #4 at their Croswell, Michigan facility. The CEMS on the boiler are for oxides of nitrogen (NO_x) and oxygen (O_2).

The RATA was performed on December 7, 2023. Stephan K. Byrd and Richard D. Eerdmans of Network Environmental, Inc. conducted the RATA in accordance with 40 CFR Part 60 Appendix B Performance Specifications 2 for NO_x and 3 for O_2. Assisting with the RATA was Ms. Meaghan Martuch of Michigan Sugar. Mr. Daniel Droste of Michigan Department of Environment, Great Lakes and Energy, Air Quality Division was present to observe the RATA and source operation.

II. PRESENTATION OF RESULTS

II.1 TABLE 1
NO_x RELATIVE ACCURACY TEST AUDIT RESULTS
BOILER #4
MICHIGAN SUGAR COMPANY
CROSWELL, MICHIGAN
DECEMBER 7, 2023

Run #	Time	REFERENCE METHOD			CEM	DIFF
		NO_x(1)	O_2(2)	#/MMBtu	#/MMBtu	
1	10:06-10:31	77.0	5.1	0.106	0.095	0.011
2	10:40-11:05	73.4	5.1	0.101	0.095	0.006
3	11:14-11:39	74.4	5.2	0.103	0.095	0.008
4	11:48-12:13	73.8	5.1	0.102	0.094	0.008
5	12:22-12:47	72.4	5.2	0.100	0.095	0.005
6	12:56-13:21	73.7	5.1	0.102	0.093	0.009
7	13:30-13:55	71.5	5.2	0.099	0.093	0.006
8	14:04-14:29	72.7	5.1	0.100	0.094	0.006
9	14:40-15:05	68.9	5.3	0.096	0.092	0.004

Mean Reference Value 0.10100

Absolute Value of the Mean of the Difference 0.00700

Standard Deviation 0.00218

Confidence Co-efficient 0.00168

Relative Accuracy = **8.59%** of mean of reference method

(1) = Concentration in term of PPM by volume on a dry basis
(2) = Concentration in terms of %

III. DISCUSSION OF RESULTS

III.1 Boiler #4 NO_x RATA – The results of the NO_x RATA for Boiler #4 can be found in Table 1 (Section II.1). The relative accuracy calculations were performed in terms of #/MMBtu in accordance with U.S. EPA Reference Method 19. The #/MMBtu results were calculated using the formula found in Section 2.1 of Method 19 for O_2 on a dry basis. The F factor used was 8,710. Nine (9) twenty-five (25) minute samples were collected from the boiler exhaust. Raw DAS output results were corrected per Equation 7E-5.

The relative accuracy for the NO_x CEMS was 5.59

% of the mean of the reference method samples.

According to Performance Specification 2 in 40 CFR Part 60 Appendix B, "The relative accuracy (RA) of the CEMS shall be no greater than 20 percent of the mean value of the reference method test data in terms of the units of the emission standard or 10 percent of the applicable standard, whichever is greater."

IV. SOURCE DESCRIPTION

CEMS service a gas-fired boiler, with a rated capacity of 120,000 pounds per hour of steam. The boiler was manufactured by Nebraska Boiler and is equipped with an economizer. The boiler was operated at approximately 71% of rated capacity during the testing.

V. CONTINUOUS MONITORING SYSTEM DESCRIPTION

The continuous emission monitoring systems (CEMS) servicing the boilers are comprised of NO_x and O_2 monitors as follows:

Boiler #4 – The NO_x monitor is a Thermo, Model 42iLS, Serial No. 1151820015, with a span of 0-200 PPM full scale. The O_2 monitor is a Brand Gaus, Model 4710, Serial No. 11394, with a span of 0-25% full scale.

analyzers measure concentrations on a dry basis.

The data produced by the CEMS is collected on a computer system that converts one minute analog averages to the appropriate hourly average in terms of the emission limits for the boiler (#/MMBtu). The system also produces a thirty-day average for daily NO_x emissions.

VI. SAMPLING AND ANALYTICAL PROTOCOL

The RATA's were performed in accordance with 40 CFR Part 60 Appendix B Performance Specifications 2 for NO_x and 3 for O_2. The sampling methods used for the reference method determinations were as follows:

VI.1 Oxides of Nitrogen – The NO_x sampling was conducted in accordance with U.S. EPA Reference Method 7E. A Thermo Environmental Model 42H gas analyzer was used to monitor the boiler exhaust. A heated probe was used to extract the sample gases from the exhaust stack. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the NO_x concentrations (PPM).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 191.0 PPM was used to establish the initial instrument calibration. Calibration gases of 55.6 PPM and 101.0 PPM were used to determine the calibration error of the analyzer. A direct injection of 50.9 PPM nitrogen dioxide (NO_2) was performed to show the conversion efficiency of the monitor. The conversion efficiency data can be found in Appendix E. The sampling system (from the back of the stack probe to the analyzer) was injected using the 101.0 PPM gas to determine the system bias. After each sample, a system zero and system injection of 101.0 PPM were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the boilers.

VI.2 Oxygen – The O_2 sampling was conducted in accordance with U.S. EPA Reference Method 3A. A Servomex Model 1400M portable stack gas analyzer was used to monitor the boiler exhaust. A heated probe was used to extract the sample gases from the stack. A heated Teflon sample line was used to transport the exhaust gases to a gas conditioner to remove moisture and reduce the temperature. From

the gas conditioner stack gases were passed to the analyzer. The analyzer produces instantaneous readouts of the O_2 concentrations (%).

The analyzer was calibrated by direct injection prior to the testing. A span gas of 21.0% was used to establish the initial instrument calibration. Calibration gases of 11.8% and 6.05% were used to determine the calibration error of the analyzer. The sampling system (from the back of the stack probe to the analyzer) was injected using the 6.05% gas to determine the system bias. After each sample, a system zero and system injection of 6.05% were performed to establish system drift and system bias during the test period. All calibration gases were EPA Protocol 1 Certified.

The analyzer was calibrated to the output of the data acquisition system (DAS) used to collect the data from the boilers.

VI.3 Sampling Locations – The sampling locations met the minimum requirement of Performance Specification 2 (2 duct diameters downstream and 0.5 duct diameters upstream from the nearest disturbances).

This report was prepared by:

Stephan K. Byrd
President

This report was reviewed by:

David D. Engelhardt
Vice President

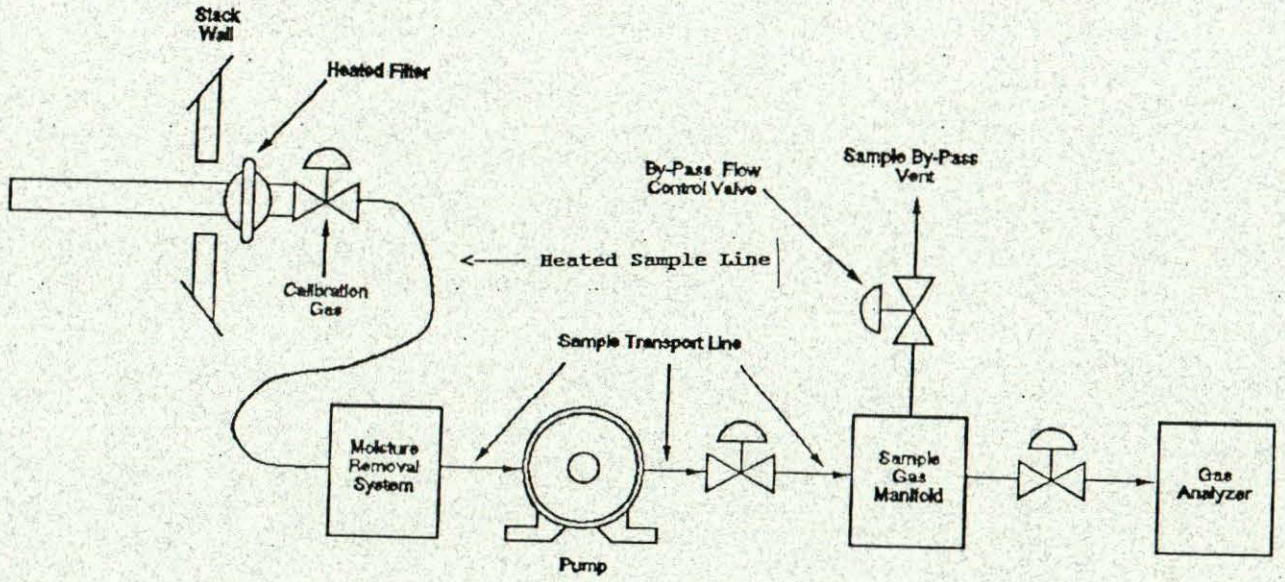

Figure 1

NO_x & O_2 Sampling Train